440 Franklin Turnpike
Mahwah, New Jersey 07430

Tel: (201) 818-6055
Fax: (201) 818-6057

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20541.010

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BROWN AND CALDWELL

Mr William J. Lee
de maximis, inc.
186 Center Street, Suite 290
Clinton, New Jersey 08809

RE: Chemsol, Inc. Site
Groundwater Extraction Wells

Dear Bill:

At our meeting with the USEPA on March 13, 2001, we discussed the extraction well locations for the Chemsol on-site groundwater containment system. By way of background, as you know, de maximis, inc. and Brown and Caldwell, on behalf of the Chemsol Site Trust, had presented an alternative approach to the USEPA for locating the extraction wells – an approach that emphasizes flexibility in establishing a zone of capture. The extraction wells under this alternative proposal would be repositioned to the north, closer to the downgradient property boundary. The intent of this repositioning is to provide greater flexibility to the capture limit on the downgradient boundary in light of the pending OU-3, off-site, investigation. That is, if the off-site work were to show the need to expand the zone of capture farther to the north, this repositioning would add such flexibility.

During a conference call on February 14, 2001, USEPA indicated that it prefers this new approach but would like to see a hybrid that includes extraction wells focusing on contaminant mass removal (USEPA's interpretation of the extraction wells to the north is that they focus on containment not mass removal). Brown and Caldwell continues to disagree with the USEPA on this point and we believe that these northerly positioned wells will also effect comparable mass removal given that the contaminant mass now resides in the bedrock matrix and localized pumping will not have a material impact on site cleanup. However, in response to the USEPA's request, and to move the project forward, an alternative proposal was presented to the USEPA that includes continued pumping of well C-1 along with the northerly positioned extraction wells, as a compromise. This well already exists and thus incorporating it into the program would be comparatively simple and continued pumping from this location would not materially affect the overall goal of containment and the requisite pumping rate to achieve such containment.

At the March 13 meeting, the USEPA indicated that it had considered this compromise but that it does not meet the Agency's objective of mass removal as enumerated in the Statement of Work (SOW) attached to the Consent Decree (i.e., "Extract and treat as much contamination as practicable from the fractured bedrock within the boundaries of the property....."). The USEPA appears to found this

conclusion, at least in part, on the presumption that groundwater quality is improving as a result of the continued operation of the interim groundwater remedy.

To the contrary, the data at the site support the understanding that restoration of groundwater quality will not be practicable and that mass removal as an end to itself is not a worthwhile endeavor. Further, given that this is a site with DNAPL in a porous bedrock medium, we believe that the groundwater extraction wells positioned at the northern property boundary do represent the practicable limits of contaminant removal as called for in the SOW.

The most compelling evidence is provided by groundwater quality data surrounding the interim groundwater treatment plant shutdown in July 1999. These data are illustrated in the attached graph of treatment plant influent groundwater quality starting in September 1994 and extending through the plant shutdown to August 1999. First consider the data from September 1994 to May 1999. The concentrations of total volatile organic compounds (VOCs) in the plant influent show a decline from a high of 74,000 ppb to 7,200 ppb. This is a typical response to pumping. The extraction system removes dissolved phase contamination in the bedrock fractures and, without a continuing addition of a source, groundwater concentrations decline. However, in the case of DNAPL in bedrock, migration of contaminants into the rock matrix represents a long-lived source, the release of which is controlled by matrix diffusion. As such, contaminants continue to migrate from the rock matrix into the dissolved phase at a rate controlled by diffusion through the rock matrix. This slow release in combination with the increased rate of flow caused by the extraction system (typically in the range of a factor or five or so) accounts for the continued presence of contaminants, but at lower concentrations.

Next consider the data collected at the time of the plant shutdown (provided to the USEPA as a part of the Twenty-First Quarterly Influent Monitoring Report and attached for ease of reference). After the shutdown and upon startup, a sample of the plant influent was collected for analysis of VOCs. The result for this sample was a total VOCs value of 224,700 ppb. This elevated concentration illustrates the classic rebound effect associated with DNAPL in bedrock upon cessation of pumping. That is, groundwater flow reverts to static conditions while the rate of contaminant release from the rock matrix remains relatively the same, and thus concentrations increase. Finally, consider the sample results from August 13, 1999 to November 7, 2000. The total VOCs concentrations have again declined to the range of 5,000 to 8,500 ppb; that is, a dynamic equilibrium with the groundwater flow system was re-established.

These data illustrate the understanding of DNAPL in bedrock. Groundwater extraction and treatment will not effect a cleanup under these circumstances. Mass removal is controlled by diffusion from the rock matrix, not by removal of groundwater. Overpumping or "source" area pumping will have little impact on groundwater quality restoration when considering the rebound effect since increasing groundwater flow only marginally increases the concentration gradient between the

rock matrix and the fracture flow system. The influence of matrix diffusion on the cleanup of fractured rock aquifers, including the phenomenon of rebound, is discussed in more detail in the attached article entitled "Cleanup of Fractured Rock Aquifers: Implications of Matrix Difussion" (Mutch, Scott and Wilson, 1991).

These realities of cleanup at sites with DNAPLs have also been acknowledged by the USEPA. For instance a memorandum from Elliott P. Laws, Assistant Administrator, to Regional Administrators, Regions I-IX (July 31, 1995), states "... Beginning immediately, RODs addressing DNAPL contamination that do not follow the policy in favor of TI waivers at such sites must include written justification for the departure from this policy." The USEPA fact sheet, "Estimating Potential for Occurrence of DNAPL at Superfund Sites," January 1992, states "The conventional aquifer remediation approach, ground water pump and treat, usually removes only a small fraction of trapped residual DNAPL."

Taken collectively, the body of information available regarding the nature and extent of contamination at the Chemsol site indicates that groundwater restoration on site will not be practicable and that efforts targeted at mass removal will be futile. For these reasons, we believe that the alternative of extraction wells at the northern site boundary is consistent with the SOW and Consent Decree and that adding more wells in an attempt to extract contaminant mass will be unproductive. In the spirit of compromise, the alternative of continued pumping of well C-1 was offered to the USEPA. However, given our understanding of the site characteristics, even this effort will not have a meaningful impact on the restoration of groundwater quality.

We hope that this information is useful in continuing the discussion of this topic at the forthcoming meetings with the USEPA.

Should you have any questions or comments, please do not hesitate to contact us.

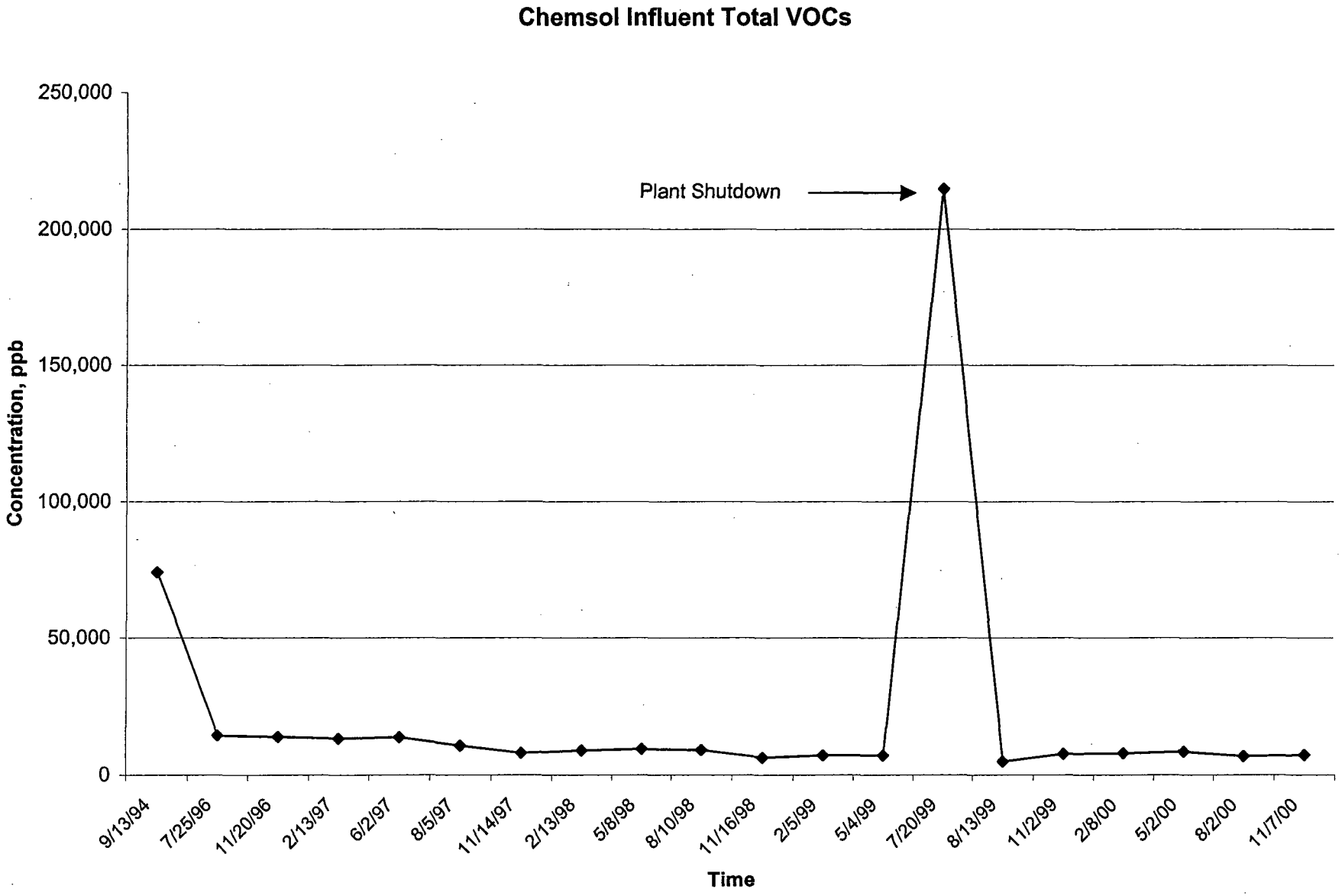
Sincerely,

Brown and Caldwell

Timothy R. Roeper
Supervising Geologist

Gary J. DiPippo, P.E.
Vice President

Enclosure


Chemsol Influent Total VOCs
250,000
200,000
150,000
100,000
50,000
0
Concentration, ppb
Plant Shutdown
9/13/94
7/25/96
11/20/96
2/13/97
6/2/97
8/5/97
11/14/97
2/13/98
5/8/98
8/10/98
11/16/98
2/5/99
5/4/99
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11/2/99
2/8/00
5/2/00
8/2/00
11/7/00
Time